The JOURNAL of GEOGRAPHY

A MAGAZINE FOR TEACHERS

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VOLUME XVIII NUMBER 9

DECEMBER, 1919

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The subscription price is one dollar a year, payable in advance. The price of a single copy is 15 cents.

The *Journal of Geography* is the official organ of the National Council of Geography Teachers and it is sent to all members of the organization. The annual dues, $1.00, are payable to the American Geographical Society.

The *Journal of Geography* is also sent to teachers who are Fellows of the Society. Annual dues are $10.00.

The *Journal of Geography* and the *Geographical Review* may be obtained by teachers at the combination price of $5.00 a year.

Remittances should be made payable to the American Geographical Society. Notification of change of address should be made promptly, both the new and the old addresses being given.

Published Monthly except June, July, and August

BY

THE AMERICAN GEOGRAPHICAL SOCIETY

BROADWAY AT 156th STREET

NEW YORK, N. Y.

Entered as second-class matter January 15, 1919, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Vol. 18, No. 9 Press of Douglas Taylor & Co., New York December, 1919

The JOURNAL *of* GEOGRAPHY

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THE POTATO: A STUDY IN PLANT GEOGRAPHY

By WILLIAM GOULD VINAL
Rhode Island Normal School, Providence

What's in a name? Surely not a little in the name "Irish potato" by which our common white potato is so generally known. "Irish," of course, is a misnomer as regards its origin. The potato is a native of the western world. It grows wild on the American continent from Chile to Mexico. The Spaniards on their arrival found it cultivated on the Andean plateaus where it formed the chief foodstuff of a large part of the population. The Spaniards came west for gold and silver and reaped a rich harvest. Vast amounts of treasure were sent across the seas to Spain, but far more important than this coveted wealth of the Incas was the humble tuber first carried to the Old World in the later sixteenth century. There is a record of the potato being taken to Spain from Quito about 1580. From Spain the tuber was brought to the seaboard of Georgia prior to 1585 and thence carried to its famous land of adoption, Ireland, by Sir Walter Raleigh's expedition.

THE POTATO IN OLD WORLD AGRICULTURE

For long after its introduction into the temperate lands of the northern hemisphere the potato received little attention from farmers. In the mid-seventeenth century an effort was made in England to promote its cultivation as a food crop for the poor people who suffered keenly during the famines that followed failures of the cereal crops. Ireland was the first European country where potato cultivation became important, and much of the history of Ireland has been bound up with it. The name "Irish potato" has thus acquired significance. On the Continent the potato began to be important at the time of the French Revolution.

Since then progress has been rapid, and today 90 per cent of the world's potatoes are grown in Europe, the crop in that continent alone almost equaling in value the wheat crop of the world. Before the war Germany was the greatest potato-producing country of the world; fourteen per cent of her cropped land was in potatoes, and the yield per acre was high—twice as high as that of the United States. In Germany, however, the potato is cultivated largely for industrial uses as well as for food. There is grown a large, flavorless variety yielding a high percentage of alcohol. Such a development betokens scientific cultivation. It is also in part a consequence of favorable conditions of soil and climate, for the cultivated potato is rather delicately adjusted to its surroundings.

Its Environmental Requirements

Water supply and temperature are the most important environmental factors. Those parts of northern and central Europe where the potato is extensively cultivated are able to secure a higher yield than the United States because of a cooler climate and a greater rainfall. The damp climate of Maine is one of the reasons for the high average yield per acre (206 bushels in 1914) in that state as compared with the average yield of the whole country (96 bushels). The potato is about 75 per cent water, and when we buy a bushel of potatoes we get about three pecks of water to one peck of starch. Its demands for moisture therefore are very great.

The soil is another important factor and is closely related to the water supply. Sand absorbs too much heat, and in sandy regions the water supply is usually some distance below the surface. Clay, on the other hand, holds too much moisture and causes the tubers to decay. Then again the root system of the potato is comparatively weak and cannot penetrate a heavy soil like clay. A rich, mellow loam is best suited to potato culture.

Its Cultivation in the United States

Although the potato is very sensitive to its surroundings it is one of our most widely distributed crops. The largest centers of production on the Atlantic coast are Aroostook County, Maine, and Norfolk County, Virginia. The San Joaquin and Sacramento

valleys are the best known districts on the Pacific coast. The planting of early potatoes starts about December 21 in Florida and moves northward with the season. The progression of planting by months gives an idea of the geographic movement of the crops: January 1, northern Florida; February 1, Georgia; March 1, Virginia; April 1, Long Island; May 1, Northern Maine. As the crop matures toward the north the distance of shipment to large centers of population lessens and the price declines. The distribution of seed potatoes is in the opposite direction, most of them coming from Maine, New York, and Minnesota. The higher temperature of the south injures their vitality.

PLANT MODIFICATION DUE TO DOMESTICATION

The domestication of the potato has brought about a complete series of changes in the plant. The ancestral potato blossomed, produced seed, and died. Consequently there were a few small potatoes. Under domestication the vine quickly lost the power of growing seed balls, many plants not even blossoming. The domestic potato plant, then, may be said to be one that blossoms, produces potatoes, and dies. Artificial selection has resulted in the production of potatoes instead of seed. The period just following the blossoming is rather precarious as there is an inherited tendency to die at that time. If the plant can be carried over this critical period it will grow for some time. If the plant enters a decline it is easily affected by heat, drought, insects, and disease. What is true of cultivated plants in general is true of the potato. When the plant is subjected to the influences of domestication it becomes physiologically weakened. When it is introduced into a new region modifications are brought about by the change in the climatic or other physical features of the environment. Any disturbance in the structure or habits of the plant may lead to the inroads of disease-producing organisms. How serious this may be in an important food plant is amply proved in the case of the potato.

THE IRISH FAMINE

It was demonstrated to the world in the great Irish famine of 1845-1847. Ireland with its increased population had come to depend upon the potato to an extreme degree. The harvest of

1845 promised to be a rich one when there came out of the west a blight which changed the luxuriant crop to a blackened waste. In the autumn of 1845 three-quarters of the potato crop was destroyed and in the two succeeding years the crops amounted to nothing at all. The consequences were more devastating and lasting than a great war. No less than 600,000 people died from famine, and emigration was started on a tremendous scale. Emigration figures for successive periods are:

1846–1851	1,240,000
1851–1861	1,149,000
1861–1871	768,000
1871–1881	618,000
1881–1891	768,000
1891–1901	431,000

THE POTATO BLIGHT

During the first 250 years of potato culture the blight was unknown. In 1887 Jensen concluded from experimentation that the blight fungus cannot exist where the mean temperature exceeds 25° C. (87° F.). From these two facts he reasoned that so long as potatoes were carried by slow-going sailing vessels the excessive heat of the tropics disinfected the tubers. In 1830-1840 the sailing vessel gave way to the steamship. The quicker means of transportation enabled the organism to exist while crossing the tropics. This conclusion was substantiated by Reed in 1912, who asserts that the disease is practically unknown in Virginia below an altitude of 2,000 feet and that it appears earlier at high altitudes. The disease scarcely ever occurs south of latitude 40° N.

The quick spread of the disease is shown by the following itinerary: France, 1840; Norway, 1841; Belgium, 1842; Denmark, 1842; Boston, 1842; New York City, 1843. The blight was responsible for our potato shortage and high prices in 1916. Here is a disease, then, originating with its host plant. The organism could have been held within bounds by the simple check of a suitable temperature.

OTHER FUNGUS DISEASES

The powdery scab is also native to the Andes. It was introduced from Europe into Canada and thence into the United States,

having been discovered in Maine by Morse and Melhus in 1913. A humid climate and damp soil favor its distribution. This disease was first studied and described by Thaxter of Harvard University. Would it not have been a good investment to have met the enemy at home?

The story of powdery scab is repeated by that of silver scurf. This was known in Europe in 1871, being first studied and described in Austria. It was next reported, 1897-1898, in Germany; 1903, in Ireland; 1904, in England; and recently in Connecticut. This disease is practically limited to the northern boundary of the United States, although it has appeared in one small area in northern Florida. Infected potatoes have been planted in the coastal states, but the disease did not appear in the field. Soil was then transported to these northern areas from ten states, and the disease was produced in eight cases; showing that a favorable climate is necessary for the existence of the disease.

A more recent pest, traveling the same path, is the potato wart disease. It was known in Hungary in 1896; it reached Newfoundland in 1909 coming by way of Germany and England on seed potatoes. It crossed the line into Aroostook County and was found in Pennsylvania in 1918. This is one of our most serious potato diseases, as no spray is effective and it persists five or six years in the soil even though no potatoes are grown in that area. It is hoped to confine the disease to this state by a quarantine act. It would have been a great deal simpler to have prevented it crossing the ocean.

Blackleg was introduced from Europe into Connecticut in 1904. The disease is spread by tubers and soon radiated over the country, being observed in New Hampshire in 1906, in Maine in 1907, and in Virginia in 1909. It has now reached the potato-growing centers of Colorado and Oregon.

A survey of the origin and distribution of the fungus diseases of the potato leads one to infer that for the most part they travel along certain geographical routes. They come uninvited, propagate rapidly, and cause tremendous destruction. A knowledge of their climatic limitations would have served to keep out most of them. Instead of shutting them out we have maintained the open

door policy and have begun the fight too late. It is too late to make amends for the past, but our responsibility for the future has become manifold.

The Potato Beetle

The story of the potato beetle serves as a good summary of the way new pests behave. Until 1856 the insect fed upon an allied plant (*Solanum rostratum*) in Colorado. Its origin is disputed; but, whatever it may be, it is interesting to note that when the beetle once got a taste of *Solanum tuberosum* it abandoned the wild food plant which its ancestors had fed upon and feasted upon our economic species. Originating as a potato pest in 1856 the beetle marched eastward at a terrific pace, covering 1,500 miles in 16 years. By 1874 it appeared on the Atlantic coast and in 1877 reached England and Germany. This was one of the first instances of a plant pest of this country moving eastward. Before this the weeds, diseases, and injurious insects of the world had been spreading westward with the progress of civilization. The isomigs (lines of equal migration) show that the march of these hordes lagged on the north and south in consequence of the extreme cold and heat, and today the insects appear on the northern and southern boundaries only when the temperature has been unusually moderate. The quick invasion of the potato beetle was aided by the prevailing westerly winds.

Our Policy in Future

A knowledge of the potato beetle and his climatic limitations should be of value in keeping him from crossing the Rocky Mountains. Irrigation has extended the geographic range of the potato, but the beetle has not yet found his way across the cold mountain barrier. A little thought and carefulness now will save these new potato areas from the heavy tax demanded by this pest.

Most of these pests, as we have seen, are aliens; but unfortunately they cannot be deported. Our future policy must be to bar the admission of others, for it would be a mistake to think that there are no more. The Bureau of Entomology of the United States Department of Agriculture has listed 3,000 injurious insects which are likely to be introduced. The Federal Horticultural

Board is backing up the Federal Embargo Act, which prohibits the importation of plants without the sanction of the United States Department of Agriculture. This will guard against the dangers of new plant diseases as well as insect pests. Another safeguard is in the recently organized American Plant Pest Committee which is made up of state foresters, entomologists, agriculturists, and pathologists. It is their duty to give publicity to the campaign and to act quickly whenever any new pest is discovered. The time seems fitting to take up an efficient means of curbing the activities of these enemy aliens. A knowledge of biogeography will play an important part in safeguarding our domestic plants from the inroads of foreign pests.

TERRITORIAL CHANGES IN CENTRAL AFRICA

On the political map of the world the "colors" for Africa reproduce those of western Europe. There are only two "different colors," representing two independent countries—Abyssinia and Liberia: all the rest of the great continent is a patchwork of colonies and protectorates politically dependent on Europe. This is the important fact in the human geography of Africa: what does it mean? Answer may be found by inquiring into the motives of colonial expansion.[1]

CENTRAL AFRICA AS A STOREHOUSE FOR INDUSTRIAL EUROPE

The primary objects in the foundation of colonies are to supply the colonizing power with

(1) Sources of raw materials;
(2) Markets for exports;
(3) New homes for the overcrowded population of the mother country.

In central Africa the third object is of little importance. The colonizing powers occupy temperate latitudes, and their emigrating population in general seeks temperate lands elsewhere. Central

[1] Compare the article by Caroline W. Hotchkiss "Some Points to Emphasize in Teaching the Geography of Africa," *Journ. of Georgr.*, Vol. 10, 1911-1912, pp. 177-184.

Africa is tropical and with certain exceptions or possible exceptions is not fitted for permanent white settlement. The interest of the nations of western Europe lies in the first and second reasons, more especially the first, in which central Africa is regarded as a great storehouse of tropical wealth. No colonizing power has had this more clearly in mind than Germany. It has been closely bound up with her modern industrial development.

GERMANY'S LATE AFRICAN EMPIRE

	AREA IN SQUARE MILES	ESTIMATED NATIVE POPULATION
Togoland	33,700	1,000,000
Cameroons	191,130	2,500,000
Southwest Africa	322,200	150,000
East Africa	384,180	7,660,000

German state colonization began in 1884. In this year the German flag was hoisted over Togoland and the Cameroons (Kamerun). Between the years 1884 and 1890 Germany came into complete possession of Southwest Africa. The German East African Company was founded in 1885, and five years later its territory passed into the hands of the state.

The strategic position of the German colonies is not without interest. German East Africa blocked the clear stretch of British territory from north to south across the continent, thus preventing construction of an all-British Cape-to-Cairo railroad. Similarly addition to the Cameroons in 1911 [2] of territory taken from French Equatorial Africa broke the continuity of the latter while it gave Germany access to two of the great rivers of central Africa, the Congo and its tributary the Ubangi. A curious feature of the boundaries of German Southwest Africa was the Caprivi salient, a long finger pointing into British territory and giving Germany access to the Zambesi. As was proved during the war these colonies had become the base of a scheme of German aggrandizement; there was in view a Mittelafrika as well as a Mitteleuropa. The attitude of German colonial administration is expressed in the words of one of its authorities who described this projected Mittelafrika as "rich in men who can work and also be used in war."

[2] A territory of 100,000 square miles ceded to Germany by the Morocco Convention of 1911.

FUTURE OF GERMANY'S FORMER AFRICAN COLONIES

Germany has lost her African colonies. Their present disposition has been settled on a basis provided for in the Covenant of the League of Nations which forms the preliminary part of the Versailles Treaty. These colonies being unfitted for independence are considered a "trust of civilization." Their administration is to be undertaken by nations best able and willing to perform the task. They are to be held as mandates under the League of Nations. The mandates involve certain general principles of which the chief are provision for the proper protection of the natives and for equal trading opportunities in the mandatary areas to all members of the League of Nations. The Supreme Council of the Allies has confirmed the following provisional distribution of mandates for African territories. The mandates for Togoland and the Cameroons are divided between Great Britain and France. That for former German East Africa is divided between Britain and Belgium. That for former German Southwest Africa is held by the Union of South Africa.

Southwest Africa

The mandate for Southwest Africa is held under different conditions from the other African mandates in that it will almost certainly form an integral part of the mandatary's own territory. The greater part of the territory is similar to the contiguous territory of South Africa, and it differs from the other German colonies in that it is without question a "white man's country." Administration from Cape Town is natural.[3]

A PASTORAL LAND

Compared with the other colonies Southwest Africa seems poor as a storehouse of natural wealth. The country lies in an arid belt. The coastal strip is real desert. In character and situation it is comparable to the Atacama Desert of northern Chile. In the Namib, as the desert is known, showers occur perhaps once in ten years; the rivers are intermittent, coming down periodically

[3] The question of a suitable name for the new province is now being discussed. Bothaland is suggested as commemorating the conquest of the territory by South Africa's late Premier, General Botha.

in flood. The ports depend on the distillation of sea water for their water supply. During the late campaign water for the troops was carried by sea from Cape Town. The coastal strip, which is 15 to 80 miles wide, is terminated by the characteristic African plateau, occupying the rest of the country and attaining an altitude of from 3,500 to 5,000 feet. Everywhere the rainfall is small. Only in the northeast does 20 inches fall over a considerable area. This is the

FIG. 1—General map showing the location of the former German colonies in Africa. Scale, 1:64,000,000.

only section where agriculture has a certain future. Here cotton and tobacco are cultivated. The remainder of the country is essentially grazing land. The native occupation of the Hereros, famous cattle breeders, gives the keynote to the development of the country.

The stony plateaus of the south where rainfall is most scanty are bush veld well suited for sheep, especially wool-producing breeds. Ostrich farming is also proving successful. About Windhuk and northward, where the rainfall is more abundant, cattle take the place of sheep as the principal stock. We may look on this

country, like the rest of South Africa, as a coming source of meat supply for Europe, the more so as the United States is already beginning to absorb a part of the South American export.

MINERAL WEALTH

During German rule progress in Southwest Africa was slow. It was impeded by the Herero war of 1904. Furthermore the

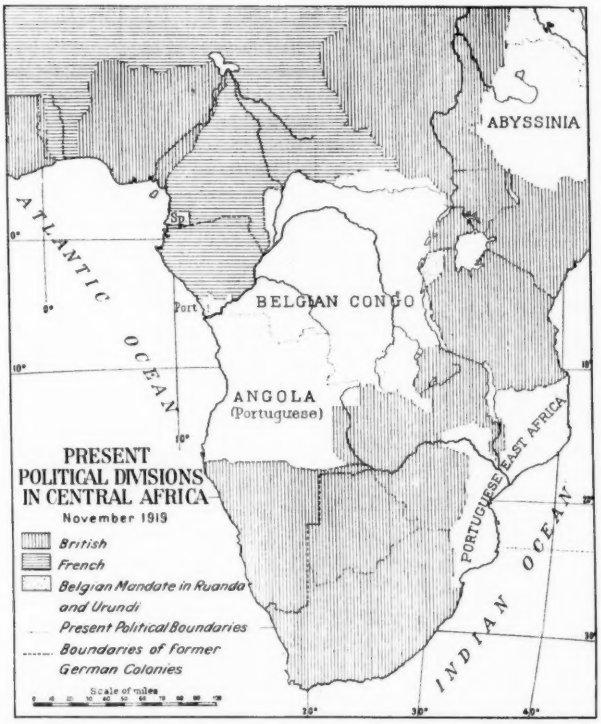


FIG. 2—Map showing the new distribution of territory in central Africa.

N. B. The blank area west of the Ubangi should be shaded horizontally. It is part of French Equatorial Africa.

German government did not encourage the colonist of medium or small means. Of the 15,000 white settlers in the colony prior to the outbreak of the war a large number were officials. Up to the present the chief revenue of the colony has come not from the pasture lands but from the barren desert. As the nitrate of northern Chile has put a high value on the barren wastes of Atacama so have the diamond fields of the Namib made valuable the Southwest African desert. In 1913 the diamonds exported from Luderitzbucht were valued at some $10,000,000. Copper also has begun to figure on the export list. It is mined round Otavi in the north.

Other assets include the railroad system built chiefly for strategic purposes. A dorsal line runs from Otavi through the capital, Windhuk, southwards. It is now connected with the Cape system. Lateral branches connect with the ports, Luderitzbucht, in the south, Swakopmund and Walvis Bay in the center. The last, an old British possession, is the only good harbor of the country. It will probably entirely replace Swakopmund, built with considerable difficulty and expense.

The Cameroons[4]

The Cameroons is representative of the tropical storehouse in its richest and most varied aspects. It might well be studied as a type area for western Africa.

The Equatorial Forest

From a mangrove-fringed coastal plain a plateau rises in the south to an altitude of 1,500 to 2,000 feet. By another step a central plateau gains an altitude of 3,000 to 4,000 feet. Westward this high plateau is capped by volcanic peaks which terminate on the coast in Cameroons Mountain (13,350 feet). Northward the plateau sinks to the plains of Lake Chad. The southern section of the country lying close to the equator and not greatly elevated has a climate of constant heat and moisture. The rainfall is exceedingly great. One of the rainfall records of the world is held by the meteorological station at the foot of Cameroons Mountain, where the average yearly rainfall is 355 inches. In consequence coastal plain and southern plateau are covered with an equatorial forest that has "no equal for vastness and impenetrability." Here is found great natural wealth, and here is experienced great difficulty in making it available.[5] White penetration has been slow. In the Cameroons the Germans had built only two short lines of railroad, aggregating 150 miles against the 1,520 miles of Southwest Africa. Few European plantations have been established, with the exception of those on Cameroons Mountain, within easy access of the sea.

[4] The name is from the Portuguese word for prawns. The early Portuguese discoverers applied it to the main estuary, which abounds in these crustaceans. The German form is Kamerun.

[5] Compare the following article "The Nature and Possibilities of Tropical Agriculture."

THE OIL PALM, CACAO, AND RUBBER

On Cameroons Mountain are many thriving cacao plantations. First place, however, among the products of the Cameroons goes to oil palm and to rubber. Rubber is found throughout the southern plateau area; the oil palm is limited to the west, to an area within certain distance of the sea. From the oil palm come two articles of commerce, palm oil, expressed from the oily fibrous coating of the nut, and palm kernels, also the source of oil. Like coconut oil, palm oil and palm-kernal oil have manifold and increasing industrial uses. Germany in particular has been interested in the production of palm-kernel oil. Before the war she alone possessed crushing and refining mills, though the production of kernels from British West Africa far exceeded the output from the Cameroons and Togoland.

THE LITTLE-KNOWN INTERIOR

Entirely different are the highland savanas and the northern plains, cut off from the seaboard by the equatorial forest and as yet little affected by European civilization. Approach to these regions has been rather by the desert whence the influences of Islam have penetrated. The native population is numerous and, like other parts of the Sudan, this region is agricultural and pastoral. The natives cultivate maize, wheat and other grains, groundnuts, sugar cane, rice, cotton; but only for local consumption: as yet there are no facilities for getting these products to market. France, who has the largest interest in northern and western Africa, has various railroad plans under consideration by which the products of the Sudanese countries may be made available. One such project is for an east to west line from Dakar, the port at Cape Verde, to Port Sudan on the Red Sea. Other trans-Saharan projects would make connection with Algerian ports, whence there would be communication with Marseilles.

THE MANDATE

Under the present conditions of the mandate for the Cameroons a western strip bordering Nigeria and including Cameroons Mountain is administered by Britain; the rest and greater part of the territory, including the commercial capital, Duala, is administered by France.

Togoland

Like the Cameroons, Togoland has been chiefly valued as a producer of the oil palm and rubber. In its prospects, however, it differs considerably from the former country. The dense equatorial forest is lacking. While as a whole the heaviest rainfall of Africa is found round the Gulf of Guinea, Togoland is curiously dry. The original forest cover destroyed by the natives in their wasteful method of agriculture has not been reproduced and the surface is now savana-covered. The country is well occupied with an active and intelligent native population. Circumstances thus favor the development of Togoland by native cultivation rather than by the creation of a European plantation system.

The Mandate

The mandate assigns western Togoland adjoining the Gold Coast to Britain. Eastern Togoland adjoining Dahomey goes to France. The French mandate includes the whole of the short coast line with Lome, the only port.

Former German East Africa

Her east African colony was the largest and most important of Germany's colonial possessions. Compared with the Cameroons this colony shows the characteristic differences between the eastern and western sections of central Africa. Products and the problems of getting them out of the country both are different.

A hot coastal plain, 10 to 30 miles wide in the north, broadening in the south, is covered with dense scrub vegetation, and here the oil palm and coconut palm thrive. The interior rises step-like to a plateau of average elevation of 3,000 to 4,000 feet, above which rise several considerable areas of higher land. A well-marked dry season, in some parts of considerable length and aridity, precludes the growth of equatorial forest. The interior is savana, grass-steppe, or scrub. The economically valuable products, as the rest of the vegetation, must be such as can support a season of drought. At present the two most important plantation crops are sisal hemp and rubber. Rubber is of a different kind from that of the forest regions. It is a species imported from Ceará, the dry northeastern section of Brazil. The city of Ceará, it may be noted,

is on the same latitude as Mombasa, center of the rubber-growing zone of East Africa. The Ceará species is short-lived and furnishes an inferior kind of rubber, but it is hardy and of rapid growth. Sisal hemp is also an introduced plant. Some 25 years ago a few specimens were imported from Yucatan; today there are millions of plants in East Africa producing a fiber of fine quality. The demand for this fiber is greater than the supply, and the future for the cultivation is very promising.

AREAS OF POSSIBLE WHITE SETTLEMENT

In the tropics at elevations of about 5,000 feet tropical temperatures are reduced to a degree "comfortable" to the white man. But whether such areas are suitable for permanent white settlement, that is as the home of a white race, remains to be proved. Altitude in the tropics, while it gives us reduced temperatures, does not reproduce the temperature regimen of the temperate zone. In particular the stimulus of the temperate winter is lacking. The character of the insolation again is different. White families have been living for some years on the highlands of East Africa but not for a period long enough to afford any definite conclusions.

In former German East Africa such areas of possible white settlement are the Usambara Highlands, near the coast, the slopes of the great Kilimanjaro, "monarch of African mountains," the highlands north of Lake Tanganyika, and those about Lake Nyasa. On the slopes of Kilimanjaro German, Greek, and Boer families have been settled for some 15 or more years, and the district has already taken on the aspect of a white man's country; such crops as wheat, beans, white potatoes, and the fruits and vegetables of temperate lands are being raised. The prospects of this district have been greatly improved since construction of the northern railroad has put it in touch with the seaboard.

PROGRESS THROUGH RAILROAD CONSTRUCTION

In this matter of communications much progress has recently been made in the colony. Just before the outbreak of the war the central railroad connecting Lake Tanganyika with the port and capital, Dar-es-Salaam, was completed. This line was designed to attract goods from over a great radius, not only in the colony itself but also from the eastern portion of the Belgian Congo.

Already it has diverted some of the traffic that formerly went by the Uganda line. The effect of railroad transportation in development of the trade of the colony may be appreciated by comparison with former methods of conveyance. Existence of the tsetse fly in certain belts prevents the employment of animal transport, and goods formerly had to be carried by bearer. In an average case the carriage of one ton from Tanganyika to the coast required 40 bearers and cost $250 without count of the loss of interest on a three months' transport, a cost that could only be supported by so expensive a product as ivory.

Projected railroad development in East Africa includes the carrying of a line into the northwestern section of the country, an area of peculiar interest that embraces the provinces of Ruanda and Urundi.

The Mandate: Ruanda and Urundi

Britain holds the mandate for former German East Africa with the exception of the provinces of Ruanda and Urundi. The Belgian mandate covers a highland area of excellent climate and inhabited by a numerous and superior native population. It has been described as "a land flowing with milk and honey, where the breeding of cattle and bee-culture flourish and the cultivated soils bear rich crops of fruit." According to the latest Belgian estimates the population is 2,500,000 to 3,000,000; and the head of cattle, 1,250,000.

These provinces will provide healthful stations and sanatoriums for the white residents in the Belgian Congo.

Addition to Portuguese East Africa

Former German East Africa adjoined Portuguese East Africa on the south. Here a final territorial change remains to be noted. This is the recovery by Portugal of Kionga, a small area on the southern bank of the Rovuma estuary.

THE NATURE AND POSSIBILITIES OF TROPICAL AGRICULTURE*

By ELLSWORTH HUNTINGTON and SUMNER W. CUSHING

Year by year men talk more and more about tropical lands and their possibilities, but few have an adequate conception of what these lands really are. There is great misconception of the extent to which different kinds of tropical regions can be relied on to provide food for a dense population and for export. The nature and possibilities of tropical labor are still the subject of the greatest diversity of opinion. Today, and for long ages to come, the chief wealth of tropical lands is bound to depend on agriculture. The possibility of successful agriculture depends first on the nature of the vegetation, and second upon the capacity of the laborers. Hence a true understanding of the probable future of the tropics demands a clear comprehension of the relation of different kinds of vegetation to agriculture.

Tropical vegetation may be divided into four great types, each of which has its own particular kind of human response. First comes the tropical rain-forest, the most exuberant type in the whole world. This grows where constant rain and warmth allow vegetation to flourish twelve months in the year. Next comes the tropical jungle. This, too, is exuberant, but the trees are less uniformly large and stately than in the rain-forest; there is much more admixture of bushy forms, and many more places where the trees are small and friendly. Such jungle grows in warm regions which are blessed with abundant rain much of the year, but which nevertheless have a distinct dry season during which there is a lull in vegetative growth.

Descending a step farther in the scale we come to tropical scrub, a low bushy growth which often resembles the second growth in our pastures or the thickets of scrub oak, manzanita, and other bushes which frequently clothe rocky hillsides in many parts of the United States. Such scrub may grow on particularly

* Reprinted with some abbreviation from the Bulletin of the Philadelphia Geographical Society, Vol. 17, 1919, pp. 83-97. The discussion was written as part of a geographical work (for teachers) publication of which has been suspended by the war work in which the authors have been engaged.—EDIT. NOTE.

dry hillsides in areas where jungle, or even rain-forest is the predominating growth, but its chief development within the tropics is in regions where the rainy season is comparatively short, and the dry season so long that plants lose their leaves and entirely cease growth for many months.

Finally grasslands form the last great tropical type, unless we consider the vegetation at high altitudes. Grass grows more or less in many parts of the tropics, but its presence in the midst of rain-forest or jungle usually means either that the rain drains away with great rapidity through a sandy soil, or else that the land is water-logged part of the year so that ordinary trees do not thrive. More commonly, however, grasslands are found where a long dry season alternates with a short wet one, and where certain conditions of soil and ground water are less favorable to scrub than to grass. The balance between grass and scrub is very delicate, but their effect on man is quite different, since scrubby areas are much more easy to cultivate than those where grass prevails.

Life in the Equatorial Rain-Forest

It seems strange that the finest vegetation should be associated with the most backward types of men. Yet such is the case in equatorial regions where high temperature is accompanied by abundant moisture at practically all seasons. In the Amazon basin, eastern Central America, west central Africa, the East Indies, northeastern Australia, and the parts of India on the seaward slope of the main mountain ranges the trees are often so huge and leafy that their lofty tops form an almost unbroken canopy through which the sun rarely shines. In these dense equatorial rain-forests the trees are often covered with bright-colored parasitic plants, while long vines hang down as soft and flexible as snakes. Near the ground there is little vegetation except where the death of an old tree has left an opening. There hosts of young plants grow so fast that they seem to be racing, the prize being life for those that attain dominance and death for the rest.

In such a region man is subject to most serious handicaps. He has little energy because the damp, steady heat never changes and never invigorates. He suffers terribly from malaria and other tropical diseases. Not only do people feel debilitated because of

the enervating climate, but the warmth and moisture cause noxious mosquitoes and other disease-bearing insects to swarm at all times. When ground was being broken for a railroad in the forest of eastern Guatemala the management dared not keep the West Indian laborers at work more than two or three weeks at a time. A longer stay would almost surely have led to death from malignant malaria.

A second great handicap in equatorial rain-forests is the difficulty of keeping domestic animals even in the clearings. Noxious insects plague them almost as badly as they plague man. For example, in large parts of tropical Africa the bite of the tsetse fly not only causes the deadly sleeping sickness in man, but is fatal to domestic animals except perhaps the donkey. Even if animals escape disease, they rarely thrive, for grain cannot be raised and what little grass can grow among the luxuriant trees is usually so rank and coarse that it is not nutritious.

The difficulty of keeping domestic animals emphasizes another great handicap of the equatorial forests, namely, the difficulty of transportation. If the natives attempt to travel through the forest without roads, they encounter swamps, great projecting roots, dense thickets, and other obstructions far worse than anything our ancestors met when they first settled in America. They are also likely to be attacked by wild beasts and snakes, as well as by poisonous insects. Suppose someone has energy enough to clear away the forest for a road. New plants spring up almost over night, and grow 10 to 20 feet in a year. A macadam road or even a railroad may suffer the same fate, although more slowly. On the railroad that runs from the Gulf of Mexico to the Pacific Ocean across the isthmus of Tehuantepec, for example, men must be employed to cut the bushes every few months.

AGRICULTURE IN THE EQUATORIAL FOREST

Another and even greater handicap of the equatorial forest is the difficulty of carrying on agriculture. When our forefathers cleared the forests of America their task was child's play compared with the clearing of an equatorial forest. Not only did they encounter smaller trees than those of the tropics, but they cut pine, birch, beech, and other soft woods most of the time, and not mahogany, teak, rosewood, and other tropical species as hard as oak.

They cut the trees in the cool bracing autumn or in winter when a man wants to work fast in order to keep warm. Think how different it would have been if they had had to cut oak trees on the muggiest kind of hot summer days. When the trees have been felled the difficulties of the would-be farmer in the equatorial rain-forest have only begun. On our farms at home it is hard work to keep down the weeds, but suppose the weeds grow a foot or two a month, and keep on growing twelve months in the year. How could anyone keep them down! The useful plants would be choked almost before they sprout from the seeds. That is what happens in the equatorial rain-forest. Unless the inhabitants possess a vigor far surpassing that of the best farmers of the temperate zone, successful agriculture is impossible.

We are apt to look down upon the almost naked Papuans of New Guinea, the Pygmies of central Africa, and the aboriginal Indians of the Amazon basin. We wonder at people who still live by hunting with poisoned arrows, who make their homes in little huts in the trees or on poles, who run and hide at the sight of a stranger, and who have nothing that can be called civilization. We ought rather to pity them, for even we, with all our opportunities, have not yet learned how to cultivate the lands in the equatorial forest, maintain good roads there, and avoid the enervating effect upon health and character. We can do these things at a place like the Panama Zone where many people are gathered in a small space, where vast sums of money are available, and where everyone is under government orders, but that is very different from the ordinary forest region. It is no wonder that the natives make little progress.

Vegetation grows so rapidly in regions of equatorial rain-forests that they might be the most productive parts of the whole world, provided men knew how to cultivate them. As yet, however, we obtain from them only such articles as rubber, chewing gum, quinine, mahogany, and other cabinet woods. The natives are employed by the white man to search for the trees from which these products are derived, but such work does not advance civilization. In temperate regions trees of the same kind often cover many square miles, but within the tropics a great variety of species usually grow together. So the natives wander through the

forests, climbing tall trees sometimes to look out over the top of others and pick out specimens of the species they are seeking. Then they tap the rubber trees and collect the sap, or call the axeman to chop down a fine mahogany tree. Their overseers are often brutal white men who have come to the tropics simply to get rich, or because they have failed at home. Unchecked by the restrictions of civilization such men use any and every means to gain wealth or to compel the natives to do what they wish. Disappointment and ill health make them more and more brutal, so that they often treat the natives most cruelly. Altogether the natives are by no means improved by their work for the white man. They merely get a pittance which they spend for drink or for useless finery. They are isolated not only from the rest of the world, but from one another, for their mode of life permits only the scantiest population. In spite of our twentieth century progress the equatorial rain-forest still remains almost the worst environment for man.

LIFE IN TROPICAL JUNGLE REGIONS

The equatorial rain-forest does not occupy the whole of the warmest regions, for large parts are occupied by less luxuriant types of vegetation. As one passes from the equatorial regions of greatest and steadiest rainfall, the size of the trees and the thickness of their stand diminish. Tropical jungle takes the place of the dripping rain-forest, and the conditions of life correspondingly improve. This does not mean that the vegetation is small or scanty. Large trees still grow in abundance, but among such kinds as mahogany, teak, rosewood, and dyewood, one finds also a bewildering variety of palms, bamboos, tree ferns, bananas, canes, and many shrubby types. In drier regions prickly creepers and thorny shrubs add to the variety of plants. For miles the tangle of vegetation is often so dense that one can penetrate it only by cutting a path through the living wall.

In regions where tropical jungle is the natural growth the people get a living with little effort, provided the population is not dense. The coconut and banana furnish food with practically no work; the big fruit of the papaw supplies a family with a meal for the plucking. Wild rice in parts of Siam and the edible seeds of the bamboo in parts of central India too rugged for farming can

be gathered when needed. Elsewhere the breadfruit tree, the sago palm, the sugar palm, the jack-fruit tree, and many other food-producing plants need only be planted and protected in order to furnish abundant food. Life is so easy that the natives have nothing to spur them to effort. Clothing is a luxury, not a necessity, so that they do not think it worth while to work much to get it. Houses need to be little more than a thatch of palm leaves set on a rude frame of poles. That is enough to keep out the rain and the wild beasts. Wood for building and cooking can be picked up anywhere.

Under such conditions we should not expect much progress among the people of the well-watered jungle regions of southern India and Ceylon, Indo-China, and the East Indies, Central America, and large areas on the borders of the dense rain-forest in Africa and South America. Those are the places which we think of as typically tropical. They form by no means all of the tropical zone, for rain-forests on the one hand and grass and dry scrub on the other occupy vast areas. Yet regions that were originally covered with jungle are the parts where the majority of tropical people live and where there is the most lavish growth of cacao, coffee, bananas and many other products which northern races are more and more importing from warm regions.

TYPES OF AGRICULTURE IN THE TROPICAL JUNGLE

The lowest and easiest type of agriculture is found in the sparse settled parts of the tropical jungle. It consists of planting a few palm trees, banana plants, and other fruit trees. After that, as is often said, the native has nothing to do except lie under the trees and wait for the fruit to drop into his mouth. Such agriculture, if we may call it by that name, is a step toward civilization, but only a slight step, for it does not stimulate the natives to steady work.

In the more densely populated tropical countries a somewhat higher type of agriculture prevails. The bushes and smaller trees of the jungle are hacked down and the larger trees are killed by cutting off a girdle of bark. At the end of the dry season the brush is dry enough to burn. Then the primitive farmer goes over the burned field with a pointed stick making holes into which seeds are dropped. A little rough weeding is carried on until the culti-

vated plants are large enough to take care of themselves. That is all the work until harvest time. The easiest food to raise is such starchy tubers as yams and the common sweet potato, or such starchy roots as the cassava or manioc from which tapioca is made. Several soft varieties of Indian corn, the common pumpkin, and various kinds of beans furnish a more healthful and more lasting supply of food than the roots. They also require more careful planning and more work, and thus have a correspondingly greater effect in promoting industry.

When the crops are harvested some provision must be made to preserve them until others are ripe. In many places the grains and roots are stowed away in rough storehouses, but in southern Mexico, for example, the farmer merely bends each cornstalk so that the top points downward and the rain cannot get into the ears. There he leaves it, gathering a little from time to time as it is needed. Of course much decays or is eaten by birds, beasts, and insects. The farmer prefers to let that happen rather than undergo the effort of building a storehouse which rats cannot enter.

Agriculture in tropical countries is more difficult than in the temperate zone. In the first place, the soil is easily exhausted. The constant heat and moisture and the ravages of white ants cause dead vegetation to disappear so completely and rapidly that the soil contains little humus and hence little nitrogen. Other plant foods are also scarce, for as soon as the soil is decomposed by weathering, the heavy rains leach them out. Thus although the first crop is often most bountiful, later ones diminish rapidly, especially when corn and millet are planted. Hence many jungle farmers clear a new patch of jungle every two or three years, and often every year. If the dry season happens to be short and showery, the bushes that have been cut may not become dry enough to burn, and no crop can be raised that year.

The difficulties due to the poor soil and rank grass are increased by the fact that in jungle regions domestic animals generally thrive only a little better than in the rain-forest. Compared with the population, the United States, for example, has nearly 30 times as many horses and mules as India. Even though cattle are seen at work everywhere in India, the total number in proportion to the people is only two-thirds as great as here, and in tropical India

they are still less numerous. This includes buffaloes as well as the common humped cattle. Moreover animals are of poor quality, undersized, ill-fed, and ill cared for. Hence not only are they unable to plough tough sod, but they supply only a small amount of manure especially in the moister regions where it is most needed. In some of the moderately dry parts of India goats and sheep are often used as manuring agents. By day they wander here and there to pick a living, but at night are penned on the fields of those who have hired their services.

As the climax of his difficulties the tropical farmer has to contend with all manner of insect pests, rusts, blights, and bacterial infections. They are worse than those of the temperate zone almost in proportion to the greater luxuriance of vegetation. Thus although the farmer can get a living without much difficulty, he is greatly handicapped when he attempts any new methods. When we add to this the lack of energy which is natural in such a climate, it is not strange that through long ages he has acquired the habit of not caring whether he makes progress or not. If our ancestors had lived for centuries in such a region, we should probably be as inefficient as the present people of the tropical jungle.

RICE CULTURE

The inefficiency of tropical people is well illustrated by the way in which rice is often raised. When the fields in the wet districts of Ceylon, for example, have been thoroughly saturated by the first rains of the season, or by water turned on from irrigation ditches, the soil is turned up with a rough spade or wooden plough and then trampled with the feet until it becomes a creamy paste of mud on which the seed is sown broadcast. When the seed has germinated, water is again admitted, and the rice left to grow until harvest time. Then the water is turned off and the crop ripens upon dry ground. The grain is harvested with sickles and is threshed by being trodden under the feet of bullocks. It is winnowed in an equally primitive fashion by being thrown into the air from flat basketwork trays, and caught again, while the chaff is blown away.

The people who practice this careless mode of rice culture are astonishingly indolent. For instance, in 1903 the inhabitants of a

certain district in Ceylon raised an unusually large crop of rice. They thereupon sat down to eat it, and raised not a blade of rice the next year. The third year their seed rice was almost all they had left. This was sown, but the crop was largely destroyed by a kind of caterpillar. Then these lazy people who had not worked for nearly two years appealed to the government to keep them from famine.

Although such occurrences are typical of tropical people, they become less common where more careful methods of rice culture are employed. In many regions, for example, the rice seed is sown in prepared beds. Then after 5 or 6 weeks it is painstakingly transplanted to the fields which have been carefully ploughed and manured. The rice fields are surrounded by mud embankments so constructed that water can be held there week after week, not standing perfectly still, but gently moving. The beds are occasionally weeded with care and finally the crop is harvested promptly so that the ripe grains may not fall out and be lost. Under good conditions 50 pounds of rice will furnish seed for an acre of transplanted rice, and the yield will be 2,400 pounds or about 50-fold. This amount, when combined with some beans or meat to furnish protein, is ample food for five adults a year. Thus a population of 2,000 per square mile is easily possible. On that basis all the people in the United States could be supported on an area equal to New York State.

Rice culture is a distinct help in promoting civilization. For one thing, a rice farmer can profitably keep cattle. Even though they are small, they can plough the soft soil of the weedless rice fields. As they can be fed on rice straw the scarcity of good grass is not important. The cattle oblige the farmer to take forethought in caring for them. They also enable him to use the same fields permanently, for they supply manure, and thus the soil does not become exhausted.

In the next place, if the enrichment of the soil enables the farmer to devote his energies to one particular piece of land he is likely to build new rice beds, take care that he has a good supply of water, and that all his little ditches and dikes are in good order. He finds that the work of one year gives him much benefit the next. Moreover, he cannot go off and leave the rice crop untended, for a few weeks of carelessness will ruin it.

All these conditions cause the careful rice-raising people of India, Java, Indo-China, and southern China to be more industrious and reliable than other tropical farmers. For the same reasons they are more hopeful and progressive, since they have learned that their efforts are not in vain. Moreover, as the population where rice is raised is much denser than elsewhere, wild animals do less damage than in other tropical regions, roads can be maintained, and the people can get more stimulus from one another and from outsiders.

POSSIBILITIES OF PLANTATION AGRICULTURE

In addition to rice farming another kind of tropical agriculture is helping to promote civilization. It depends on the fact that the people of more bracing climates are willing to pay good prices for tropical products which once were luxuries but are fast becoming necessities. Before the days of steam navigation, when Europeans rarely came to the tropics, there was no agriculture for export. Hence there was no crop for which money was paid, for tropical trade was then almost wholly by barter, as it is now in many primitive regions. Accordingly the farmers could not lay up capital. Their rule was "Grow all you need and consume all you grow."

When Europeans came to the tropics, however, they began to want tea, coffee, cacao, rubber, and other products. In general these are not like the staple food crops which have to be planted each year. They are tree crops which do not require frequent renewal. Hence they are raised in large plantations where the same kind of tree or bush is planted over wide areas. Coffee is a good example. Although small quantities are raised in regions such as Java, Ceylon, Central America, and Mocha where it first became known, four-fifths of the world's supply comes from Brazil. There hundreds of thousands of acres of tropical jungle have been cleared of most of the trees, and coffee bushes have been planted in the shade of the rest. Tea flourishes under similar conditions, although it grows over a wider range of latitude than coffee. It is raised in great plantations on moist sunny slopes not only in places like Ceylon and the lower Himalayas north of Calcutta, but especially in southern China.

Bananas fall in the same class with tea and coffee. They prefer the moister parts of the jungle on the borders of the equatorial rain-forest, and grow well in broad lowlands. In Central America, the West Indies, and the northern part of South America great corporations from the United States have cleared thousands of acres of jungle and planted it with this easily raised fruit. One great company employs many thousand men and has regular lines of steamships to bring bananas and other tropical fruits to New Orleans, Baltimore, Philadelphia, New York, and Boston. In the same way Europeans and Americans have established large plantations for the cultivation of the cacao tree from whose pods chocolate is made. Some cacao comes from tropical Africa, particularly the Island of Saint Thomas (Sao Thomé), and from Asia and the East Indies, but two-thirds of the world's supply is from the jungles of Central America, the West Indies, and the northern part of South America.

Still other tropical plants, such as the manilla hemp of the Philippines, the best of fibers for strong twine and rope, have their home in the jungle, but are gradually being raised more and more exclusively in plantations. The same is true of indigo, which is still raised in large quantities in India and Java in spite of the great use of aniline dyes made from coal tar. Quinine, the great remedy for malaria, is another article which was formerly derived from wild trees, but now the cinchona tree from whose bark it is made is cultivated in plantations not only in the Andean countries of its origin such as Bolivia and Colombia, but in Java, Ceylon, India, and Jamaica. The sweet bark of the cinnamon tree, raised especially in Ceylon, furnishes still another example of the many kinds of tropical products which are being more and more used by Europeans and Americans, and which lend themselves to plantation agriculture.

To the world at large the most important of all plantation crops is sugar. Two hundred years ago, the average person in England consumed less than four pounds of sugar per year, and the average American a decidedly smaller quantity. Today, under normal conditions, the average English consumption is almost 100 pounds, and the American over 80. Sugar has become such an important food that the average person consumes a third as much

of it as of wheat. Hence it is not surprising that many of the sugar plantations, such as those of Hawaii, are of large size and highly profitable.

The Future of the Tropics

The preceding discussion of the relation of vegetation to civilization deals only with some of the more elementary phases of the problem in two of the most important types of tropical region. Those elementary phases, however, are at the very foundation of future progress. The white man may exploit the tropics and skim them of their wealth, but that will do the world little good unless at the same time there comes into existence a tropical population which is sufficiently civilized and sufficiently energetic to raise more than enough for its own needs. Strange and disconcerting as it may be, the luxuries and exports of the tropics seem to be easier to raise in large quantities and on a permanent basis than the staples which are adapted to the nutrition of a sturdy and healthful people. Judging by the present conditions the greatest of all problems will always be the people. First, to give them the incentive to work; second, to enable them to keep domestic animals fit not only for ploughing and to furnish fertilizer but for human food; third, to make it possible to raise the great staples such as corn and rice permanently for generation after generation on the same land; and fourth, to make the people healthy and energetic enough so that they will want to produce more than enough for their own consumption—these are among the greatest of tropical problems. Back of all of them stand the inexorable facts of the effect of climate upon the growth and vigor of both plants and animals, including man. If we would rightly estimate the future possibilities of the tropics these are the most basic of all subjects of study.

NOTES FROM THE CLASS ROOM

ILLUSTRATIVE GEOGRAPHY WORK

Few of us make sufficient use of the textbook pictures. With the use of carefully selected topics made by the teacher the child can gain more by studying the pictures in his geography than by any amount of reading from the average textbook.

The exhibits which I have obtained make my work vital. The children never tire of seeing, feeling, and studying the real illustrations which we have. Most of the exhibits are obtained at little or no cost from various manufacturing firms.

Many of our pictures and booklets I have obtained from hotels, railroad and steamship companies and chambers of commerce. These furnish excellent working material.

It may not be out of place to mention here the type of bulletin board which we use. As simple and inexpensive as they are, I have never seen them used elsewhere. The sixth grade boys made them by tacking two pieces of molding on burlap, so that the molding forms the top and bottom. The heavier molding keeps the burlap in better shape. Such a bulletin board is an advantage because there need be no tacks in the wall and furthermore it can be moved for instruction purposes.

Sometimes instead of making industrial maps, we make industrial charts to show the steps in some one industry. The best pictures for these charts are from the yearly reports of the Bureau of Agriculture. To me all group-work in connection with maps and charts has a civic value deeper than the geography lesson, inasmuch as none of this work can be done unless each one does his duty. If children can learn to do team work, they, as grown people, will become community workers.

GEOGRAPHY AND NOTEBOOK WORK

Children need to see some permanent result of their work. The children in my school copy the topics which the teacher has written on the blackboard, study them, and enlarge upon them in as good sentences as possible. Their work is well illustrated with pictures, drawings, etc. Many of the children have "Scrap Boxes" in which they save all pictures, labels, etc., which they think at some time

may be useful to them. For example, Tosca has a box with advertising pictures of tapioca, tea, coffee, peaches, silk, and many newspaper clippings. Before Tosca completes her course in the grades most of these pictures will find their place in her notebooks.

GEOGRAPHY AND HAND WORK

Hand work is a great aid to the pupil. It makes the child more alert to gain accurate knowledge and, best of all, helps him remem-

A corner of the Geography Room. "The children never tire of seeing, feeling and studying the real illustrations which we have."

ber that which he gains through the eye, by reading, and that which he gets through the ear, from the class-room work. During the year we make many types of maps,—salt maps, paper pulp maps, product maps, colored maps, and blackboard maps.

For salt maps for a class of forty take eight cups of salt, eight tablespoons of white flour, and eight tablespoons of cornstarch. Mix thoroughly and add two cups of water. Cook for about ten minutes on the stove, stirring constantly to prevent scorching. When it is somewhat cooled, add sufficient salt to make it a good consistency to work with the fingers. The mixture should be applied on manila paper and when dry mounted on blue paper.

To make paper pulp maps ordinary paper pulp may be procured for little or nothing from a paper mill. Before these maps are made it is best to have wooden trays to form them on. The best dimensions for the average map are seven by ten inches, the sides being about half an inch high. The map is then made on the tray and, when dry, removed with the aid of a knife. Then it is ready for coloring and mounting. If there are lakes or seas to be shown, blue paper should be placed back of them.

GEOGRAPHY AND ARITHMETIC

Concrete arithmetic is most interesting when the teacher connects the work with the geography lesson, and each subject is made more vital thereby. For example, Fall River manufactures two miles of cloth a minute, how much does it manufacture in an hour? It takes 2,500 silk worms to make a pound of silk, how many silk worms helped to make your mother's best dress?

GEOGRAPHY AND TABLE STANDARDS

There are a few facts which every child should know in order to make just comparisons. Before our class studies Europe we know the following table: population of the home city, population of state capital, population and area of home state, population of Boston, etc. When the class studies a given country it learns its status by *comparison,* not by any failing attempt to remember numbers. Incidentally the child is learning to use the table in the back of his book.

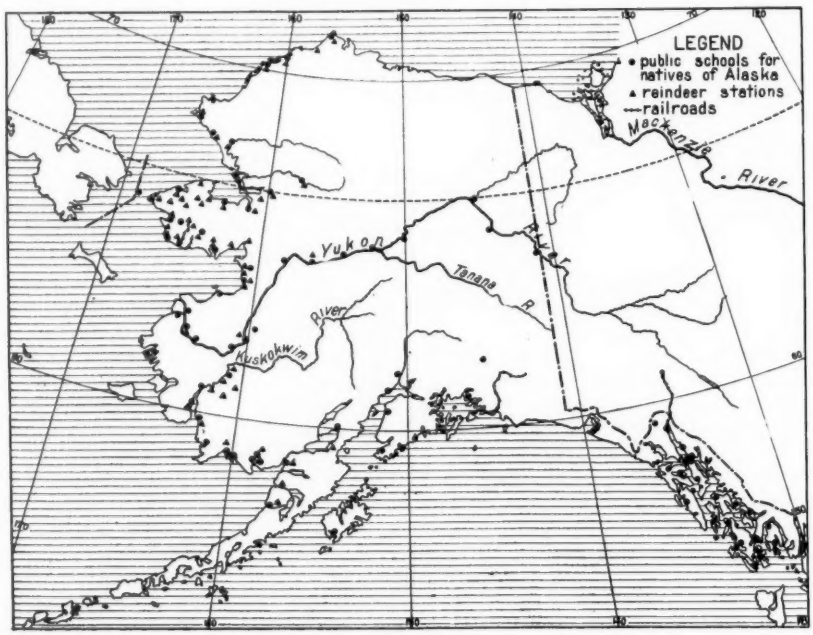
BARBARA E. HAM

EDUCATING THE ALASKAN ESKIMO

The Bureau of Education's annual report on its work for the natives of Alaska (Report for 1917-18, Bull. 40, Washington, D. C., 1919) is a document to be read by all teachers of geography. Not only does it enlist the professional interest. In a consideration of the peculiar problems that confront the teacher in Alaska the character of the country and its inhabitants is vividly realized. The work of the Bureau is intimately concerned with improvement in the economic and social conditions of life in the native com-

munities and in this no measure has given such fruitful results as introduction of the reindeer.

Reindeer were first brought into Alaska in 1892 (compare the item, A Project of Reindeer Raising in the Canadian Northwest, *Journ. of Geogr.*, February, 1919, p. 79). At the end of the fiscal year, June 30, 1918, the herds numbered 120,000, of which 69 per



The schools of Alaska are social centres exercising a far-reaching influence on the physical, moral and industrial welfare of the adults as well as the children. Among the various educational measures that of the reindeer service has been most fruitful in its results.

cent were owned by natives and from which during the year they had derived a total income of nearly $100,000.

A special social feature of the work is the organization of reindeer fairs. During the winter such fairs were held at four places in northwestern Alaska. Competitions and exhibits offered stimulus to improvement in various phases of the work and the personal intercourse of individuals from over a wide area had its effect in the promotion of good fellowship and the desire for social progress. In concrete form it led to the organization of the Eskimo Reindeer Men's Association, the object of which is to awaken the natives to their own responsibilities and to secure united sentiment and action in important matters affecting the Eskimo race.

A short description of the fair at Noatak (67° 30′ north latitude) is given below:

As we drove out to the grounds, 8 miles from the village of Noatak, we soon came to the upper end of the race course, which, through its entire distance, was outlined by neatly trimmed stakes, set at intervals of 200 yards; from the top of each stake fluttered a red, white, and blue pennant, the work of the sewing class of the school. On the plateau, where the races started, we were met by the crowd of delegates, who were lined up there ready to give us a cheer. On the plateau was a tent over which floated a large American flag, also a "reindeer flag," the pride of the Noatak herders. This flag has a red reindeer on a white field with a blue border; this flag was about 10 feet square. The tent had a good stove in it, and it was reserved for the judges and secretaries, giving them a place where they could figure out the winners of the different events without freezing their fingers.

After this reception we were escorted down the little creek bed, and as we turned a bend we saw the main camp before us. A large *Welcome* sign was posted high in a tree whose branches had been trimmed. A blue and gilt pennant of large size, with Noatak in big letters, with trees on each side (the Noatak symbol), floated over the main tent. Between two trees was hung another big reindeer flag, and on the most conspicuous tree floated the largest American flag that could be procured. The Eskimo delegates lived in the big tent, and visitors camped in their own tents all around. The Eskimo delegates had their mess and the white delegates had theirs. The cooking class of the Noatak school cooked and served our meals and were awarded the blue ribbon as cooks.

The most impressive thing connected with the fair was the salute to the flag each evening. This was arranged by Mr. Maguire. At the beginning of the evening meeting in the big tent Mr. Maguire played a bugle call on the organ; then he began to play "My Country, 'tis of Thee." From the back of the tent came a procession. In front marched two of the most prominent head herders, each carrying a 30-30 rifle. Next marched an old Eskimo carrying the flag. He was followed by two of the younger reindeer men with rifles. They lined up in front of the audience and then all sang the first verse of "My Country, 'tis of Thee." During the entire verse the audience stood and held the right hand rigidly at salute. It was exceedingly impressive to see old, decrepit Eskimos, men and women, struggle to their feet and hold that salute. I noticed some of the old folks, who did not thoroughly understand the salute, holding their hand over their eyes, and I saw their lips move, as in prayer. There are no people who love and honor the Government more than do the Eskimos.

MEAT EXPORTS OF ARGENTINA

Before the war Argentina was far and away ahead of other meat exporting countries. In 1913 her export was double the amount of her nearest rival. During the war shipments continued to increase, but the United States once again took the lead. This was, of course, in response to the urgent demands of Europe, and it was met, in part at least, by the restrictions on domestic consumption. In a comparison of the meat exports of the United States and Argentina it must, however, be borne in mind that three-quarters of the United States export is pork, a meat that scarcely figures as yet in the Argentine exports. The 1917 export of Argentina, 561,000 tons was made up of beef (frozen, chilled and jerked), 70 per cent; mutton, 7 per cent, and the remainder chiefly of derived meat products (*Bulletin Pan-American Union,* September, 1919).

To put the matter as briefly as possible, the dominance of Argentina in beef export lies in her grassy plains, her still sparse population and the improvements relative to the industry effected during the last twenty-five years.

The United States has twice as many cattle as Argentina, but an inferior number in proportion to population: where the latter has 430 head of cattle to every 100 persons the United States has only 58. In the Pampa, the fertile plains occupying Buenos Aires and parts of the adjacent provinces, Argentina has a great natural grazing ground now improved by the introduction of better grasses and the system of fenced pasturage. The introduction of alfalfa in particular has changed the grazing industry of the Pampa; it has "increased twenty times the pasturage capacity of the land." Refrigerating and packing plants have been established and transportation facilities include the railroad net radiating fan-like across the Pampa from the city of Buenos Aires.

On the Pampa the growth of agriculture and of cattle raising has caused a decrease in the number of sheep, their place being largely taken by swine. This, however, is a shifting of the industry rather than a decline, for sheep are rapidly increasing in the southern territories of Argentina, where the sheep farmer is the pioneer of civilization.

A PROBLEM STUDY ON AFRICA

An excellent illustration of the use of the problem method in geography teaching may be found in the article "The Partition of Africa—A Seventh-Grade Geography Unit" by Edith P. Parker in the *Elementary School Journal* for November (Price per single copy 20 cents, George Banta Publishing Co., Menasha, Wis.).

After a brief general survey of the continent based on a study of the physical map the attention of the class was drawn to current interest in Africa and clippings were brought from newspapers and magazines. To understand the situation the class decided that answer must be found to three major problems: How is Africa divided among the European nations? How does Germany's late share compare with the shares of other European nations? What determined the size and location of the shares each country has? Questions 1 and 3 were answered by study of the political map and data in the class text followed by consultation of such material as Chamberlain's Africa, Carpenter's Africa, Jacob's Story of Geography and Discovery and the World Book (a children's encyclopedia). The work in large part was based on a series of maps of the discovery and partitioning of Africa. The maps, simplified in form, were hectographed from Keltie's Partition of Africa. Selections from Keltie and from Lucas's Historical Geography of the British Colonies were read aloud to the class. Passages from the graphic story of Africa, Powell's The Last Frontier, were written on the blackboard for class study.

The work involved in question 2 was divided. Each child chose a colony or group of colonies for detailed study according to a prepared outline and reported thereon to the class. Current events were now reviewed in the light of the information thus gained.

An interesting sequel followed in a morning assembly exercise based on the study and given at the request of other members of the school. An introductory talk gave a synopsis of the story of the Partition. Special topics followed in historical sequence, use being made of enlarged copies of the maps used in the class study. A particularly graphic rendering of the political map at the out-

break of the war was furnished. On a cork bulletin board measuring 3 feet by 4½ feet the outline of Africa was traced. The colonies were cut out in brightly colored cardboard and placed on the outline by one child as another briefly described them. The stage was appropriately decorated for the purpose to express the idea of Africa's natural wealth.

A HOT "HURRICANE"; THE *LEVANTO* OF THE CANARIES

Study of the wind systems of the world includes reference to a variety of local winds consequent on the cyclonic circulation. The foehn, chinook, sirocco, mistral, bora are all well known from their important human effects. They are described briefly in most text books of physical geography while fuller accounts may be found in such meteorological texts as Davis's Elementary Meteorology.

Among the less known winds belonging to this class is the *levanto*. The levanto, which blows over the Canary Islands as a hot southeasterly wind, may be considered a form of the sirocco. When a well marked cyclonic depression passes to the north of the islands the indraft brings hot, sand-laden air from the Sahara. Occasionally this wind arrives with hurricane force and then is responsible for serious destruction to vegetation and crops. The *African World* (Sept. 20, 1919) describes a recent occurrence of the levanto.

> It is to be feared that the tomato and banana industries of the islands have suffered considerably from the Levanto or Southeast wind which swept down upon the Orotava valley (north of the Peak of Tenerife) in a hurricane of hot air charged with Saharan sand, and more than a suspicion of volcanic gases from the Peak. It began to come in hot puffs like a gust from a furnace on the evening of August 22. During the night it attained to the force of a hurricane, and raged all next day and the following night, bursting open shutters and doors, filling the houses with layers of dust, and nearly choking their inmates. Trees came crashing onto roofs, and all vegetation visibly wilted before the scorching blast. Thousands of young tomato plants were killed, the bananas were blackened and rendered unsalable, and the ripe and ripening grapes of the higher slopes simply shrivelled

and withered. Forest fires broke out spontaneously in several places adding dense clouds of smoke to the fog of dust.

The intense heat of the wind was doubtless due in part to foehn influence, that is to compression and consequent heating during the rapid descent into the Orotava valley.

IN CURRENT PERIODICALS

THE GEOGRAPHICAL FACTOR IN HISTORY

"Geographic Problems in American History" by H. A. Bone (*Mississippi Valley Historical Review,* Cedar Rapids, Iowa, May, 1919) is a short statement of the author's view that "geographic environment is a constant which relates and rationalizes history." In history teaching geographic influence is yet rarely recognized in more than an incidental—or accidental—way. To maintain a consistent attitude in the history teaching in his own school, Mr. Bone has outlined a series of 37 problems dealing with the principal movements in the development of the United States. A list of the problems is given in the article. In manual form (price 40 cents) they may be obtained from the author at the High School, Sioux City, Iowa.

THE TEACHING OF PHYSIOGRAPHY

Professor Collier Cobb's address as President of the North Carolina Association of Geography Teachers is published in the *High School Journal* for November, 1919 (University of North Carolina, Chapel Hill, N. C.), under the title "The Teaching of Geography in the High School." After prefatory remarks on the generally deplorable situation of geography and needs for its improvement, Professor Cobb gives suggestions and criticisms on the physiographic side.

GEOGRAPHY IN UNIQUE SCHOOLS IN SPAIN

"Educational Conditions in Spain" by Walter A. Montgomery (Bureau of Education, Bull. 17, Washington, D. C., 1919) notes certain schools in Huelva where the entire procedure is based on

the theory of the predominant importance of the graphic method of instruction. In geography "the unique feature is the intensive and leisurely study of the large contour map of Spain, modeled in cement. Thorough familiarity with this is absolutely prerequisite to the pupil's passing on to the large line map drawn upon the wall. The next step is to fit into the setting of coast, plain, hill, and mountain the centres of population accompanied by the exposition of reasons for original settlement, and the local productions and industries. Then comes the study of political and civic divisions, with means of intercommunication."

NATIONAL COUNCIL OF GEOGRAPHY TEACHERS

The National Council of Geography Teachers will hold its annual meeting in St. Louis, from December 29 to 31, 1919. The first meeting will be held Dec. 29 at 1:30 P. M. and the second meeting at 7:45 P. M. Any unfinished portion of the program will be presented at a date to be announced. Wednesday afternoon, December 31, the National Council and the Association of American Geographers will meet in joint session. At this meeting the presidential addresses of President Albert P. Brigham and President Charles R. Dryer will be delivered.

All meetings will be held in the Soldan High School. The headquarters of the Council will be at the Statler Hotel.

As the scientific societies meeting in St. Louis include the American Association for the Advancement of Science it is probable that a reduced railroad rate—a fare and one-third—will be obtainable. As the next issue of the *Journal* will be too late to carry the final decision it is recommended that a certificate (not a receipt) be obtained when the railroad ticket is purchased.

PROGRAM

The Teaching of Regional Geography:

- Geography of a Continent, W. M. Gregory, Cleveland Normal School.
- Geography of a Country, E. E. Lackey, State Normal School, Wayne, Nebraska.
- Geography of a Small Area, Dr. A. E. Parkins, George Peabody College for Teachers, Nashville, Tenn.

The Problem Method of Teaching Geography, M. E. Branom, Harris Teachers College, St. Louis.

Report on Normal School Geography by Chairman of Committee, Sumner W. Cushing, State Normal School, Salem, Mass.

Report on Elementary and Secondary School Geography by Chairman of Committee, Dr. Albert P. Brigham, Colgate University.

Ways and Means of Increasing the Efficiency of Geography Teaching through the State and National Councils:

R. H. Whitbeck, University of Wisconsin.
R. P. Green, State Normal School, Bowling Green, Ky.
Jane K. Atwood, State Normal School, Emporia, Kan.
W. M. Gregory, Cleveland Normal School.

Geography Teaching and the War, President Albert P. Brigham. Address to be delivered at the joint session, Dec. 31.

GEORGE J. MILLER, *Secretary*,
State Normal School, Mankato, Minn.

AMERICAN METEOROLOGICAL SOCIETY

Teachers of geography will probably be interested in the plans for the organization of an American Meteorological Society, the objects of which shall be the advancement and diffusion of the knowledge of meteorology and climatology; and the broadening of their applications in public health, agriculture, engineering, industry and commerce. It is proposed to have a monthly leaflet of communications and notes of interest, while already existing mediums of publication such as the *Monthly Weather Review,* the *Geographical Review,* the *Journal of Geography,* and *Science* will be used as before for the publication of contributions in meteorology and climatology. Teachers who touch on meteorology or climatology will probably find that the contacts with one another and with Weather Bureau people, farmers and business men who use their knowledge of the weather professionally, will serve to enliven their instruction and thus to increase the interest of their classes in weather and climate.

On account of not having to support a scientific publication the dues of the proposed society probably will be only one dollar, except for those who wish to contribute towards an endowment fund. Formal organization will be effected at the end of December at the St. Louis meeting of the American Association for the Advancement of Science. Those interested should write now to C. F. Brooks, Weather Bureau, Washington, D.C.

GEOGRAPHICAL PUBLICATIONS

A MAP OF THE NEW EUROPE

The New Map of Europe is still in the process of formation. Only nine of the twenty-nine major countries have fixed boundaries. Other nine countries may experience moderate territorial changes as the result of treaty or plebiscite while four countries are open to great territorial change and no less than seven "new" countries (including Albania) may never realize political independence. The old political map of Europe is of little use. No new map can be final and the various tentative maps are naturally of very varying merit. The teacher may well ask what she shall do. Happily a solution is now at hand in the **Map of the Prospective Countries of Europe** (1919) by Mark Jefferson.

Professor Jefferson has had unique opportunities for preparation of such a map. He acted as chief of the division of geography with the American Peace Commission in Paris and also sat with representatives of the other great powers in a commission of geographical experts who made the final revision of boundaries in the Treaties with Germany and Austria.

Professor Jefferson's map shows the countries of Europe and the Near East and their chief cities, the areas where plebiscites are to be taken, the internationalized areas and the chief areas in dispute—Teschen, the Banat and the eastern Adriatic. An accompanying leaflet gives approximate areas and population of the countries as interpreted on the map, a statement of the main contentions in the disputed areas and other explanatory matter.

Price and other particulars regarding the map will be found on the opposite page.

OUTLINE OF THE GEOGRAPHY OF EUROPE

Several references on new material for the study of Europe have already been given in the *Journal*. To these we now add the **Topical Outline of the Geography of Europe** (1919) by H. W. Fairbanks, author of the well-known Geography of California.

The outline is presented according to the problem method. For each major division or country a major problem is stated in detail. Subjects for special problems are listed, together with suggestions for map studies and topics for oral or written reports. The outline is published by the Harr Wagner Publishing Company, San Francisco, California.

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PRIZE ESSAYS

The AMERICAN GEOGRAPHICAL SOCIETY announces the offer of three prizes of $100 each for the best essays on selected geographical topics.

Particulars of the competition, which closes February 15, 1920, are given in the September number of the *Journal of Geography* (price 15 cents).

The American Geographical Society

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1388—**Pressure Ridge, Arctic Sea Ice.** Detail view, shows jamming up of huge ice blocks.

1389—**Mt. Hood, Oregon.** H. Willcox photo. View, from south, of typical dormant volcanic cone of American northwest. Shows timber line clearly.

M-228—**Chart of Average Winter Temperatures, New York City, 1871-1918.** Shows great fluctuations in individual years but almost absolute uniformity over all four 12-year periods included. Demonstrates uniformity of average climate.

M-229—**Seasonal Snowfall 1884-1918, New York City.** Chart, graphic, showing inches of snowfall each year. Certain years 1892-3 maximum, 1918-19 minimum, show great fluctuations from 35-inch normal.

M-230—**Evaporation, Condensation and Re-evaporation of Water at Air Temperatures below Freezing, Ithaca, N. Y.** February 4 1915. Water evaporating and forming wisps of condensed moisture which in turn disappear in invisible vapor. From south side of barn roof in hot sun, while north side and ground are snow covered.

M-231—**Flood in Residence District, Wheeling, W. Va.** March 20, 1913. Shows flood waters half way up first story of residences.

M-232—**Deep Snow in Timber on Cascade Range, Oregon.** March 23, 1911 Illustrates effect of forested mountain summits in conserving moisture supply of water-sheds.

M-233—**Burnt Over Timber Lands, Cascade Range, Oregon.** March 23, 1911. Shows effect of forest fires over wide reach of summit mountain slopes and effect on moisture conservation.

1390—**Wide Expanse of Mountain Summits, Cascade Range, Oregon.** March 21, 1911. Illustrates mountain ridges rising to nearly uniform level. Mt. Hood, volcanic cone, rising high above, in distance.

1391—**Glacial Swamp, near North Spencer, N. Y.** Typical swamp in outwash plain due to melting out of buried glacial ice and subsequent slumping of overlying sediments.

1392—**Lake Champlain and Adirondack Mountains From Lake Champlain, N. Y.** Distant view of Adirondack summits as seen from steamer on Lake Champlain.

1393—**Lake George, near Hulett's Landing, N. Y.** Typical view of island-studded Lake George, with glaciated mountain shores.

1394—**Rapids, Long Sault, St. Lawrence River.** Near view of rapids from deck of steamer passing through them.

1395—**Lower St. Lawrence River, Alexandria Bay, N. Y.** Below Thousand Islands. One of the numerous lake-like expanses of this very young river which has not yet cut a channel into the country over which it flows.

X-1222—**Harbor, Oswego, N. Y.** Shows entrance to harbor at outlet of Oswego River. September, 1919.

X-1223—**Siphon Lock, Oswego Branch of New York State Barge Canal, Oswego, N. Y.** Second largest lock of its type in the world. September, 1919.

X-1224—**Unloading Pulp Wood, Harbor, Oswego, N. Y.** Coal is shipped into Canada from this lake port and pulp wood received in return. September, 1919.

X-1225—**Power and Canal-Lock Dam, Oswego River, near Oswego, N. Y.** Shows large volume of water flowing over great dam. Water represents the drainage flow from the Finger Lakes of Central New York. September, 1919.

X-1226—**Rochester, N. Y., Main Street.** Typical business street of modern American city. September, 1919.

X-1227—**Maple Sugar Grove in Summer, Central New York State.** Shows typical small grove of hard maple trees and sap house.

X-1228—**Cabbage Field, Cortland, N. Y.** Cabbages grown on large scale, in general district of vegetable production for canning, on outwash glacial deposits. Group of kame hills in background. September 18, 1919.

X-1229—**Erie Canal in Rochester, N. Y.** Shows part of old canal still in use. September, 1919.

X-1230—**Burlington, Vt.** Site as seen from Lake Champlain. August, 1914.

X-1231—**Montreal, Canada.** Looking north from head of inclined railway at summit of Mt. Royal. August, 1914.

X-1232—**Montreal, Canada.** Looking down St. Lawrence River from summit of Mt. Royal. McGill University shows in foreground. August, 1914.

X-1233—**Calash, Quebec, Canada.** Typical carriage in use in this French-Canadian city.

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The *Journal of Geography* is also sent to teachers who are Fellows of the Society. Annual dues are $10.00.

The *Journal of Geography* and the *Geographical Review* may be obtained by teachers at the combination price of $5.00 a year.

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Published Monthly except June, July, and August

BY

THE AMERICAN GEOGRAPHICAL SOCIETY

BROADWAY AT 156th STREET

NEW YORK, N. Y.

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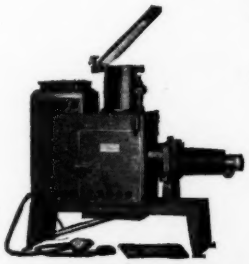

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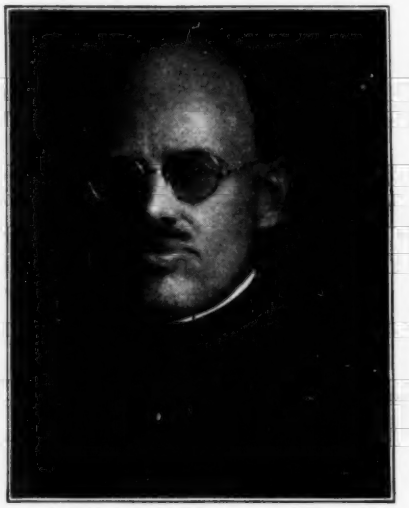

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